Group 4: Project 3

1) Implement the novelty-facilitated Hebbian learning rule described by Blumenfeld et al. (2006) and simulate the network on gradual and mixed morph sequences (Figure 4).

2) Behavioral experiments suggest that it is distinctiveness, rather than novelty per se, that enhance memory (Poppenk et al., 2010). In fact, these studies have found an advantage for familiar over novel information when discrimination demands are held constant. Can the Blumenfeld model account for these findings? You don't need to literally simulate the Poppenk experiments; you can implement a simplified version in which you manipulate familiarity (i.e., inverse novelty) and distinctiveness within a sequence of neural patterns. Familiarity can be manipulated by changing the number of times a pattern is presented to the network, and distinctiveness can be manipulated by the similarity between different patterns.

3) Discuss how this theory might be realized neurally by the hippocampal-VTA loop (Lisman & Grace, 2005).

References:

Blumenfeld, B., Preminger, S., Sagi, D., & Tsodyks, M. (2006). Dynamics of memory representations in networks with novelty-facilitated synaptic plasticity. *Neuron, 52*, 383–394.

Lisman, J.E., & Grace, A.A. (2005). The hippocampal-VTA loop: controlling the entry of information into long-term memory. *Neuron, 46*, 703–713.

Poppenk, J., Köhler, S., & Moscovitch, M. (2010). Revisiting the novelty effect: When familiarity, not novelty, enhances memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*, 1321–1330.